

APPENDIX C

BACKGROUND AND GENERAL REGULATORY PERSPECTIVE

A. BACKGROUND

Since November 1996, a series of radiological control performance issues have emerged at Connecticut Yankee Atomic Power Company's (CY) Haddam Neck Plant. An NRC inspection (50-213-96-12) conducted in November 1996, to review an event involving personnel exposure at Haddam Neck, revealed significant deficiencies in the licensee's Radiation Protection Program and its implementation. On December 5, 1996, CY announced the permanent shutdown of Haddam Neck¹ and indicated its plan to decommission the facility, an activity that would involve significant radiological work. Subsequent NRC inspections revealed continuing problems in the area of radiological control, including control of radioactive materials and maintenance of radiation monitoring systems.

Based on problems identified in these inspections, NRC determined that CY's apparent deficient performance and ability in radiation protection warranted immediate and comprehensive assessment and corrective action. Accordingly, NRC issued a Confirmatory Action Letter (CAL) on March 4, 1997, that confirmed the licensee's commitment to make improvements in its radiation protection program. In subsequent correspondence, the licensee committed to limit radiological work activities until radiation program improvement was accomplished.

As described by the CAL, the licensee conducted a comprehensive review and assessment of the radiation protection program, which revealed significant programmatic deficiencies. Accordingly, CY established a Radiation Protection Program Improvement Plan designed to significantly improve overall performance relative to: monitoring and control of radioactive material and contamination; radiological effluent monitoring and control; radioactive waste processing and handling; and control and monitoring of radiological work and radiation exposure of personnel. This licensee improvement effort is still in progress and is being closely monitored by the NRC.

In conjunction with radiation protection program improvement initiatives, CY initiated efforts to scope the radiological status of the facility and its environs. The purpose of this effort was to estimate the extent of on-site contamination (in normally radiologically controlled areas and on adjoining CY controlled property) that would require remediation to support decommissioning. As a result, CY discovered that licensed materials (i.e., contaminated soil, debris, construction materials and other articles) may have been improperly monitored and released for unrestricted use during the 30-year operating life of the facility. Consequently, CY expanded the characterization activity to establish plans to review previous practices relative to monitoring, control and release of the suspected materials; to determine possible or probable locations of such material; and to achieve retrieval or remediation, as necessary.

¹Connecticut Yankee Atomic Power Company correspondence to NRC, dated December 5, 1996.

Subsequently, CY confirmed the presence of licensed materials in various off-site locations, including private residences. The instances to-date involved only low-level or trace concentrations. Consequently, while detection of the material in unrestricted locations was unexpected, in all cases examined to date there was no apparent impact on public health and safety. However, the finding resulted in significant public concern about the past operation of the facility and possible impact on public safety. Currently, the NRC continues to monitor and evaluate CY's actions to identify and remediate off-site locations, maintain communication with the Connecticut Department of Environmental Protection (CT-DEP) and perform confirmatory sampling and analysis of suspect materials.

Additionally, the Federal Energy Regulatory Commission (FERC)² initiated a rate case hearing process in early 1997 to establish the validity of costs that may be applied to the rate base as a result of decommissioning of Haddam Neck. Testimony, provided on behalf of the Connecticut Department of Public Utility Control (PUC), identified several events, based on licensee records and information, which resulted in radiological soil and ground contamination of the facility over its 30-year operational life, that may have affected decommissioning costs. While the PUC testimony was focussed on CY's management and control, the statements and characterizations elicited strong public concern about the status of current public health and safety in the immediate vicinity, as well as the quality of licensee performance and regulatory effectiveness over the last 30 years of operation.

A number of radiological control performance issues emerged after the license announced plans to permanently shutdown. Multiple NRC-identified radiation protection program deficiencies; detection of contaminated materials in various off-site locations; and published testimony before the FERC engendered questions relative to the present extent of residual facility contamination and the ability of the licensee to adequately characterize the site for eventual site decommissioning. These matters also produced interest relative to the circumstances that resulted in on-site contamination and the detection of radioactive contamination in some off-site locations and the effectiveness of NRC's regulatory oversight.

These matters drew considerable attention from the public. The concern was shared by local and state government officials, including the Governor, the state's Attorney General and interested Members of Congress. Accordingly, on October 23, 1997, the NRC established an action plan for performing a limited historical review of radiological controls and area contamination issues at Haddam Neck.³ This historical review was conducted by members of the NRC staff having expertise in licensing, inspection, and various aspects of

²In accordance with the Federal Power Act and the Public Utilities Regulatory Policies Act, the Federal Energy Regulatory Commission approves rates for the wholesale of electricity and transmission in interstate commerce involving private utilities, power markets, power pools, power exchanges and independent operators.

³Memorandum to L. Joseph Callan, Executive Director of Operations, from Hubert J. Miller and Samuel J. Collins, dated October 23, 1997, Action Plan Related To Radiological Control and Area Contamination Issues at Haddam Neck.

radiation protection and reactor plant decommissioning. Primarily, the effort involved review of available licensee historical records and pertinent NRC regulatory documentation relative to the specified objectives of the action plan.

B. GENERAL REGULATORY PERSPECTIVE

The Nuclear Regulatory Commission's system of regulation is based on the fact that the primary responsibility for the safe design, construction and operation of any commercial nuclear power plant principally rests with the licensee. The NRC's primary function includes setting regulatory standards and specifications for radiological and nuclear safety relative to the conduct of licensed activities, ensuring compliance through inspection and enforcement, and conducting systematic assessment of performance. In this manner, the NRC and its licensees share a common responsibility to protect the public health and safety and the environment.

To accomplish this objective, the agency has established a system of licensing and regulatory activities that includes, among other functions, a formalized process for licensing and inspecting the operation of commercial nuclear reactors; the development and implementation of rules and regulations that govern licensed nuclear activities; investigation of safety-significant events or allegations of impropriety involving NRC-licensed activities; enforcement of NRC regulations and license conditions; establishment of working relationships with affected states; collection, evaluation and dissemination of information pertaining to operational safety of commercial nuclear power plants; and the audit of licensee performance and conformance with regulatory requirements, including radiological control and radiation protection.

The NRC's inspection role is accomplished by examining various aspects of licensee performance of activities relative to regulatory requirements. Periodic audits are conducted of licensee programs and processes that are necessary for the safe conduct of licensed activities to ensure they are established, implemented and maintained in accordance with the design and licensing bases. Relative to radiological aspects, the agency's normal inspection process is accomplished by periodically auditing the licensee's radiation protection program performance, including: quality of commitment to safety; technical capabilities relative to radiological monitoring, assessment and analyses; staffing, relative to selection, qualification and training of personnel; quality of processes and procedures; problem resolution and corrective action effectiveness; conformance with regulatory requirements and specifications; and the quality of efforts to maintain exposures to workers, the public and the environment as low as reasonably achievable (ALARA). Reactive inspection activities are usually conducted for emergent or abnormal conditions that have the potential to significantly impact worker or public health and safety, or have demonstrated a significant health and safety consequence.

The Haddam Neck plant was one of the earliest plant designs approved by NRC's predecessor agency, the Atomic Energy Commission. The Construction Permit was issued in May 1964 and commercial operation commenced January 1968. The facility met the

construction and system design and licensing requirements then imposed by the AEC and was approved by the agency in accordance with the existing licensing process.

Since the establishment of the Atomic Energy Act of 1954, the licensing process evolved significantly over time, increasing in the level of detail considered by the staff. As described in NUREG/BR-0175⁴, during the late 1950s and early 1960s the use of nuclear power to generate electricity was a novel and developing technology. In accordance with the Atomic Energy Act of 1954, the AEC did not require that a prospective power reactor owner submit finalized technical data on the safety of a facility to receive a construction permit. The agency was willing to grant a conditional permit as long as the application provided "reasonable assurance" that the projected plant could be constructed and operated at the proposed site "without undue risk to the health and safety of the public."

In this early period, at Haddam Neck (as well as other facilities), the AEC's emphasis and attention was directed toward the "front-end" of nuclear power plant safety, i.e., the safe operation of the nuclear steam supply system and the associated engineered safety features, particularly emergency core cooling systems. Accordingly, the principal inspection focus was the safe operation of the nuclear reactor and the radiological safety of plant personnel. Accordingly, the agency advanced public health and safety (and environmental protection) by assuring that reactor systems were operated and maintained properly. The "back-end" inspection activities, e.g., the examination and assessment of aspects, such as radioactive waste processing and radiological effluent monitoring and control, contributed to the overall process of determining the adequacy of plant design, operation and control, and the effectiveness of licensee performance.

Generally, AEC inspection activities were periodic audits by various agency specialists. The inspection process, relative to radiological controls, was implemented to determine if the licensee adequately established, implemented and maintained procedures to meet regulatory requirements in areas that affected radiation protection of workers, the public and the environment. Inspections were focused on assuring that fundamental aspects and specifications were met, e.g., that workers were effectively monitored for radiation exposure and the exposures were maintained within the regulatory limits, access to high radiation areas was controlled in accordance with license requirements, radiological postings and barriers were properly established and maintained, the spread of radiological contamination within the plant was controlled and monitored, appropriate surveys were conducted to support radiological work and radiological gaseous and liquid effluent releases were in conformance with regulatory requirements.

The regulatory limits specified in 10 CFR 20 were established conservatively, well below values that could affect public health and safety. To assure that these regulatory limits would not be exceeded, the licensing bases established conservative safety limits, including associated surveillance and procedural requirements. The licensee's conformance with the

⁴ "A Short History of Nuclear Regulation, 1946-1990," J. Samuel Walker, NRC Historian, Office of the Secretary, Nuclear Regulatory Commission. Published by the NRC as NUREG/BR-0175.

specified surveillance and procedural requirements was inspected regularly. Radiological waste processing and effluent control programs were generally viewed as successfully implemented if the gaseous and liquid radiological releases were maintained in accordance with the applicable regulatory requirements and technical specifications. As new General Design Criteria (GDC) and ALARA Design Objectives were later introduced by the agency in June 1974, the licensees were required to evaluate the existing systems and make modification as necessary to meet new established criteria and objectives.

In 1977, the NRC initiated a significant review of the design of older operating nuclear power plants to confirm and document their safety relative to more recent design and licensing requirements that were established in 1975⁵, determine how differences should be resolved and evaluate existing plant safety. The Haddam Neck facility was selected as one of the older plants subject to the NRC's program for Integrated Plant Safety Assessment⁶ in accordance with the NRC's established Systematic Evaluation Program. The assessment determined that safety margins were adequate and that the plant did not pose an undue safety risk to public health and safety. Notwithstanding, the assessment did recommend a variety of equipment modifications or additions, some changes to procedures and Technical Specifications and various engineering evaluations and design analyses.

In March 1979, NRC Region I inspection resources were diverted to accommodate agency response to the accident at Three Mile Island. Significant staff efforts were directed toward accident response and investigation, survey and radiological evaluation of the facility and surrounding environment, regulatory review, lessons-learned assessment and preparation for congressional hearings. Consequently, regulatory attention to Haddam Neck and other Region I facilities was limited during that period. In addition, while not a direct outcome of the TMI accident, the agency established its commitment to the NRC Resident Inspector Program to improve its monitoring of plant activities. The NRC resident inspector for Haddam Neck began in March 1980.

Relative to radiological control initiatives, the agency further refined the concept of As Low As Reasonably Achievable (ALARA) and developed new regulatory guidance and requirements to effect the ALARA concept in plant design, radiological effluent releases and radiological control practices. In the case of Haddam Neck, this led to enhancements in radiological environmental technical specifications and plant effluent control and monitoring practices and design. NRC inspection activities became more focused on assessing the licensee's ALARA efforts and the results achieved. Annual effluent releases decreased to typically less than one millirem -- a small fraction of the annual release limits.

More recently, inspection program implementation at Haddam Neck and other facilities has been directed toward performance-based endeavors. Inspection attention is focused toward

⁵Standard Review Plant, NUREG-75/087, published December 1975 and updated July 1981 as NUREG-0800.

⁶NUREG-0826, Integrated Plant Safety Assessment, Haddam Neck Plant, June 1983; NUREG-1185, Integrated Safety Assessment Report, Haddam Neck Plant, July 1987.

evaluating human performance errors and the licensee's efforts to achieve remediation for recurring human performance problems; assessing material condition of equipment and facilities that have the potential to impact plant and public safety; and encouraging and promoting licensee conduct of self-assessment (i.e., problem identification, root cause determination and corrective action effectiveness).